Designation: D 4950 – 01 (Reapproved 2004)$^{\epsilon 1}$

An American National Standard

# Standard Classification and Specification for Automotive Service Greases[1,2]

This standard is issued under the fixed designation D 4950; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ($\epsilon$) indicates an editorial change since the last revision or reapproval.

$\epsilon^1$ NOTE—Parts of speech were added to Section 3 editorially in June 2004.

## INTRODUCTION

This specification describes current categories of lubricating greases for automotive service-fill applications. A specific designation is assigned to each category. The system is open ended, that is, new designations are assigned for use with new categories as each new set of grease performance characteristics is defined. Grease categories are referenced by automotive manufacturers in making lubrication recommendations and used by grease suppliers and users in identifying products for specific applications.

## 1. Scope

1.1 This specification covers lubricating greases suitable for the periodic relubrication of chassis systems and wheel bearings of passenger cars, trucks, and other vehicles.

1.2 This specification defines the requirements used to describe the properties and performance characteristics of chassis greases and wheel bearing greases for service-fill applications.

1.3 The test requirements (acceptance limits) given in this specification are, as the case may be, minimum or maximum acceptable values for valid duplicate test results. No additional corrections for test precision, such as described in Practice D 3244, are to be applied inasmuch as the precision of the test methods was taken into account in the determination of the requirements.

1.4 The values stated in SI units are to be regarded as the standard. The values given in inch-pound units are for information only.

## 2. Referenced Documents

2.1 *ASTM Standards:* [3]

D 217 Test Methods for Cone Penetration of Lubricating Grease

D 566 Test Method for Dropping Point of Lubricating Grease

D 1264 Test Method for Determining the Water Washout Characteristics of Lubricating Greases

D 1742 Test Method for Oil Separation from Lubricating Grease During Storage

D 1743 Test Method for Corrosion Preventive Properties of Lubricating Greases

D 2265 Test Method for Dropping Point of Lubricating Grease over Wide Temperature Range

D 2266 Test Method for Wear Preventive Characteristics of Lubricating Grease (Four-Ball Method)

D 2596 Test Method for Measurement of Extreme-Pressure Properties of Lubricating Grease (Four-Ball Method)

D 3244 Practice for Utilization of Test Data to Determine Conformance with Specifications

D 3527 Test Method for Life Performance of Automotive Wheel Bearing Grease

D 4170 Test Method for Fretting Wear Protection by Lubricating Greases

D 4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants

D 4289 Test Method for Elastomer Compatibility of Lubricating Greases and Fluids

D 4290 Test Method for Determining the Leakage Tendencies of Automotive Wheel Bearing Grease Under Accelerated Conditions

D 4693 Test Method for Low-Temperature Torque of Grease-Lubricated Wheel Bearings

2.2 *SAE Standards:*[4]

[1] This classification and specification is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.B0 on Automotive Lubricants.

Current edition approved May 1, 2004. Published June 2004. Originally published in 1989. Last previous edition approved in 2001 as D 4950–01.

[2] This classification and specification was developed as a cooperative effort among the American Society for Testing and Materials, the National Lubricating Grease Institute (NLGI), and the Society of Automotive Engineers (SAE).

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Available from Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.

AMS 3217A Standard Elastomer Stock-Test Slabs
AMS 3217/2B Test Slabs, Acrylonitrile Butadiene (NBR-L)-Low Acrylonitrile, 65-75[5]
AMS 3217/3B Test Slabs Chloroprene (CR)-65-75
SAE J310 Automotive Lubricating Greases

## 3. Terminology

3.1 *Definitions:*

3.1.1 *lubricant, n*—any material interposed between two surfaces that reduces the friction or wear between them. **D 4175**

3.1.2 *lubricating grease, n*—a semi-fluid to solid product of a dispersion of a thickener in a liquid lubricant.

3.1.2.1 *Discussion*—The dispersion of the thickener forms a two-phase system and immobilizes the liquid lubricant by surface tension and other physical forces. Other ingredients imparting special properties are often included. **D 217**

3.1.3 *thickener, n—in lubricating grease*, a substance composed of finely-divided particles dispersed in a liquid to form the product's structure.

3.1.3.1 *Discussion*—The thickener can be fibers (such as various metallic soaps) or plates or spheres (such as certain non-soap thickeners) which are insoluble or, at the most, only very slightly soluble in the liquid lubricant. The general requirements are that the solid particles be extremely small, uniformly dispersed, and capable of forming a relatively stable, gel-like structure with the liquid lubricant. **D 217**

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *automotive service grease, n*—a lubricating grease suitable for the periodic relubrication of serviceable-type, chassis components or wheel bearings of passenger cars, trucks, and other vehicles and distinct from factory-fill greases (also known as initial-fill and OEM greases) initially installed by the original equipment manufacturer.

3.2.2 *category, n—with respect to automotive service grease*, a designation, such as LB, GC, etc., for a given level of performance in standardized tests.

3.2.3 *chassis grease, n*—an automotive service grease used to lubricate ball joints, steering pivots, universal joints, and, other lubrication points designated in the vehicle owner's service guide.

3.2.4 *classification, n—with respect to automotive service grease*, the systematic arrangement into categories according to differing levels of performance.

3.2.5 *"G" category group, n*—automotive service greases of such composition, properties, and performance characteristics as to be suitable for the service lubrication of those types of wheel bearings that require periodic relubrication.

3.2.6 *"L" category group, n*—automotive service greases of such composition, properties, and performance characteristics as to be suitable for the service lubrication of those types of suspension, steering, and drive-line components that require periodic relubrication.

3.2.7 *multipurpose grease, n*—an automotive service grease suitable for both chassis and wheel bearing lubrication.

3.2.7.1 *Discussion*—Commercial lubricating greases other than *automotive service greases* are often designated as multipurpose greases.

3.3 *Abbreviations:*

ASTM—American Society for Testing and Materials
NLGI—National Lubricating Grease Institute
SAE—Society of Automotive Engineers

## 4. Performance Classification[6]

4.1 Automotive service greases are classified into two general groups. Those designated with an "L" prefix (chassis greases) are intended for the service lubrication of ball joints, steering pivots, universal joints, and other chassis components as designated by the equipment manufacturer. Those designated with a "G" prefix are intended primarily for the service lubrication of wheel bearings. These groups are further subdivided into categories with intended service applications as follows:

4.1.1 *LA*—Service typical of chassis components and universal joints in passenger cars, trucks, and other vehicles under mild duty only. Mild duty will be encountered in vehicles operated with frequent relubrication in noncritical applications.

4.1.2 *LB*—Service typical of chassis components and universal joints in passenger cars, trucks, and other vehicles under mild to severe duty. Severe duty will be encountered in vehicles operated under conditions which may include prolonged relubrication intervals, or high loads, severe vibration, exposure to water or other contaminants, etc.

4.1.3 *GA*—Service typical of wheel bearings operating in passenger cars, trucks, and other vehicles under mild duty. Mild duty will be encountered in vehicles operated with frequent relubrication in noncritical applications.

4.1.4 *GB*—Service typical of wheel bearings operating in passenger cars, trucks, and other vehicles under mild to moderate duty. Moderate duty will be encountered in most vehicles operated under normal urban, highway, and off-highway service.

4.1.5 *GC*—Service typical of wheel bearings operating in passenger cars, trucks, and other vehicles under mild to severe duty. Severe duty will be encountered in certain vehicles operated under conditions resulting in high bearing temperatures. This includes vehicles operated under frequent stop-and-go service (buses, taxis, urban police cars, etc), or under severe braking service (trailer towing, heavy loading, mountain driving, etc.).

[5] With respect to elastomer AMS 3217/2A, the elastomer specification has been superseded by AMS 3217/2B. Per SAE, the elastomers are identical, however the synthetic lubricant immersion fluid used to reference the elastomer has been exchanged from ARM-200 to AMS 3021. Reference fluid AMS 3021 better represents current market aviation fluids.

[6] The letter designations for the grease categories and the corresponding Performance Classification descriptions in Section 4 were developed by an *ad hoc* panel of the NLGI Literature Subcommittee in cooperation with ASTM D02.B0.04.02, (Subsection on) Automotive Grease Specifications. Although these designations and descriptions of the categories have been adopted *in toto* in this standard, the NLGI Literature Subcommittee retains jurisdiction over them as published in, "Chassis and Wheel Bearing Service Classification System," available from the National Lubricating Grease Institute, 4635 Wyandotte Street, Kansas City, MO 64112. It is the intention of Subcommittee D02.B to include in this standard future revisions to these descriptions providing they are deemed acceptable by ASTM.

TABLE 1 "L" Chassis Grease Categories

| Category | Test | Property | Acceptance Limit |
|---|---|---|---|
| LA | D 217 | Consistency, worked penetration, mm/10 | 220–340[A] |
| | D 566 or D 2265 | Dropping point,° C, min | 80 |
| | D 2266 | Wear protection, scar diameter, mm, max | 0.9 |
| | D 4289 | Elastomer SAE AMS 3217/3B Compatibility: | |
| | | Volume change, % | 0 to 40 |
| | | Hardness change, Durometer-A points | −15 to 0 |
| LB | D 217 | Consistency, worked penetration, mm/10 | 220–340[A] |
| | D 566 or D 2265 | Dropping point,° C, min | 150 |
| | D 2266 | Wear protection, scar diameter, mm, max | 0.6 |
| | D 4289 | Elastomer SAE AMS 3217/3B compatibility: | |
| | | Volume change, % | 0 to 40 |
| | | Hardness change, Durometer-A points | −15 to 0 |
| | D 1742 | Oil separation, mass %, max | 10 |
| | D 1743 | Rust protection, rating, max | Pass |
| | D 2596 | EP performance: | |
| | | Load wear index, kgf, min | 30 |
| | | Weld point, kgf, min | 200 |
| | D 4170 | Fretting protection, mass loss, mg, max | 10[B] |
| | D 4693 | Low-temperature performance, torque at − 40°C, N·m, max | 15.5 |

[A] Vehicle manufacturer's requirement may be more restrictive; grease containers should display NLGI Consistency Number as well as category designation.
[B] The fretting wear requirement is significant in passenger car and light-duty truck service, but it has not been shown to be significant in heavy-duty truck applications.

## 5. Performance Description[7]

5.1 The performance characteristics of the several categories of automotive service greases are described as follows:

5.1.1 *LA*—The grease shall satisfactorily lubricate chassis components and universal joints where frequent relubrication is practiced (at intervals of 3200 km or 2000 miles or less for passenger cars). During its service life, the grease should resist oxidation and consistency degradation and protect the chassis components and universal joints from corrosion and wear under lightly loaded conditions. NLGI 2 consistency greases are commonly recommended, but other grades may also be recommended. (NLGI Consistency Numbers are shown in Table X1.1 of the appendix.)

5.1.2 *LB*—The grease shall satisfactorily lubricate chassis components and universal joints at temperatures as low as − 40°C (−40°F) and at temperatures as high as 120°C (248°F) over prolonged relubrication intervals (more than 3200 km or 2000 miles for passenger cars). During its service life, the grease should resist oxidation and consistency degradation while protecting the chassis components and universal joints from corrosion and wear even when aqueous contamination and heavily loaded conditions occur. NLGI 2 consistency greases are commonly recommended, but other grades may also be recommended.

5.1.3 *GA*—The grease shall satisfactorily lubricate wheel bearings over a limited temperature range. Many products of this type are limited to bearing temperatures of − 20 to 70°C (−4 to 158°F). No additional performance requirements are specified for these greases.

5.1.4 *GB*—The grease shall satisfactorily lubricate wheel bearings over a wide temperature range. The bearing temperatures may range down to − 40°C (−40°F), with frequent excursions to 120°C (248°F) and occasional excursions to 160°C (320°F). During its service life, the grease shall resist oxidation, evaporation, and consistency degradation while protecting the bearings from corrosion and wear. NLGI 2 consistency greases are commonly recommended, but NLGI 1 or 3 grades may also be recommended.

5.1.5 *GC*—The grease shall satisfactorily lubricate wheel bearings over a wide temperature range. The bearing temperatures may range down to − 40°C (−40°F), with frequent excursions to 160°C (320°F) and occasional excursions to 200°C (392°F). During its service life, the grease shall resist oxidation, evaporation, and consistency degradation while protecting the bearings from corrosion and wear. NLGI No. 2 consistency greases are commonly recommended, but NLGI No. 1 or No. 3 grades may also be recommended.

## 6. Performance Requirements[7]

6.1 The greases identified by these categories shall conform to the requirements listed in Table 1 and Table 2. A guide to the requirements of all the grease categories is given in Table X1.2 of the appendix.

6.2 The consistency requirements in Table 1 and Table 2 cover NLGI Consistency Numbers 1 through 3 (see Table X1.1). However, because the equipment manufacturers recommendations may be more restrictive, it is recommended that grease containers display the consistency number as well as the grease category designation.

6.3 Some grease makers market products under the term *multipurpose grease*, implying or stating that such products are suitable for both chassis and wheel bearing lubrication. To comply with this specification, greases intended and suitable for both chassis and wheel bearing lubrication may carry such designation but, in addition, shall carry both an "L" and "G" designation (LB-GC, for example) and conform to the appropriate requirements listed in Table 1 and Table 2.

## 7. Keywords

7.1 automotive grease categories; automotive service grease; chassis grease; multipurpose automotive grease; NLGI

[7] The Performance Descriptions and Performance Requirements for the grease categories, as described in Sections 5 and 6, were developed by ASTM D02.B0.04.02 in cooperation with the NLGI Literature Subcommittee. ASTM Subcommittee D02.B retains jurisdiction over these descriptions (see Footnote 7).

**TABLE 2 "G" Wheel Bearing Grease Categories**

| Category | Test | Property | Acceptance Limit |
|---|---|---|---|
| GA | D 217 | Consistency, worked penetration, mm/10 | 220–340[A] |
| | D 566 or D 2265 | Dropping point,° C, min | 80 |
| | D 4693 | Low temperature, performance, Torque at – 20°C, N·m, max | 15.5 |
| GB | D 217 | Consistency, worked penetration, mm/10 | 220–340[A] |
| | D 566 or D 2265 | Dropping point,° C, min | 175 |
| | D 4693 | Low temperature performance, Torque at – 40°C, N·m, max | 15.5 |
| | D 1264 | Water resistance at 80°C, %, max | 15 |
| | D 1742 | Oil separation, mass %, max | 10 |
| | D 1743 | Rust protection, rating, max | Pass |
| | D 2266 | Wear protection, scar diameter, mm, max | 0.9 |
| | D 3527 | High temperature life, hours, min | 40 |
| | D 4289 | Elastomer SAE AMS 3217/2B compatibility:[B] | |
| | | Volume change, % | –5 to + 30 |
| | | Hardness change, durometer-A points | –15 to + 2 |
| | D 4290 | Leakage tendencies, g, max | 24 |
| GC | D 217 | Consistency, worked penetration, mm/10 | 220–340[A] |
| | D 566 or D 2265 | Dropping point,° C, min | 220 |
| | D 4693 | Low temperature performance, Torque at – 40°C, N·m, max | 15.5 |
| | D 1264 | Water resistance at 80°C, %, max | 15 |
| | D 1742 | Oil separation, mass %, max | 6 |
| | D 1743 | Rust protection, rating, max | Pass |
| | D 2266 | Wear protection, scar diameter, mm, max | 0.9 |
| | D 3527 | High temperature life, hours, min | 80 |
| | D 4289 | Elastomer SAE AMS 3217/2B compatibility:[B] | |
| | | Volume change, % | –5 to + 30 |
| | | Hardness change, durometer-A points | –15 to + 2 |
| | D 4290 | Leakage tendencies, g, max | 10 |
| | D 2596 | EP Performance: | |
| | | Load wear index, kgf, min | 30 |
| | | Weld point, kgf, min | 200 |

[A] Vehicle manufacturer's requirement may be more restrictive; grease containers should display NLGI Consistency Number as well as category designation.

[B] With respect to elastomer AMS 3217/2A, the elastomer specification has been superseded by AMS 3217/2B. Per SAE, the elastomers are identical, however the synthetic lubricant immersion fluid used to reference the elastomer has been exchanged from ARM-200 to AMS 3021. Reference fluid AMS 3021 better represents current market aviation fluids.

chassis and wheel bearing service classification; NLGI grease classification; wheel bearing grease

## APPENDIXES

**(Nonmandatory Information)**

## X1. SUPPLEMENTARY INFORMATION ON PROPERTIES

X1.1 The National Lubricating Grease Institute has classified greases according to their consistency as measured by the worked penetration (Test Methods D 217) at 25°C. The classification is as follows Table X1.1:

**TABLE X1.1 NLGI Consistency Numbers**

| NLGI Number | Worked Penetration at 25°C (tenths of a millimetre) |
|---|---|
| 000 | 445 to 475 |
| 00 | 400 to 430 |
| 0 | 355 to 385 |
| 1 | 310 to 340 |
| 2 | 265 to 295 |
| 3 | 220 to 250 |
| 4 | 175 to 205 |
| 5 | 130 to 160 |
| 6 | 85 to 115 |

X1.2 Table X1.2 is a guide to the requirements for the grease categories; it is meant to provide a quick comparison of the properties defined for each category. Refer to Table 1 and Table 2 for the actual values of the requirements.

**TABLE X1.2 Guide to Requirements for Grease Categories**

| Test | Description | LA | LB | GA | GB | GC |
|---|---|---|---|---|---|---|
| D 217 | Penetration | ✓ | ✓ | ✓ | ✓ | ✓ |
| D 566[A] | Dropping point | ✓ | ✓ | ✓ | ✓ | ✓ |
| D 1264 | Water washout | — | — | — | ✓ | ✓ |
| D 1742 | Oil separation | — | ✓ | — | ✓ | ✓ |
| D 1743 | Rust protection | — | ✓ | — | ✓ | ✓ |
| D 2266 | Four-Ball wear | ✓ | ✓ | — | ✓ | ✓ |
| D 2596 | Four-Ball extreme pressure | — | ✓ | — | — | ✓ |
| D 3527 | High temperature life | — | — | — | ✓ | ✓ |
| D 4170 | Fretting wear | — | ✓ | — | — | — |
| D 4289 | Elastomer compatibility | ✓ | ✓ | — | ✓ | ✓ |
| D 4290 | Leakage | — | — | — | ✓ | ✓ |
| D 4693 | Low-temperature torque | — | ✓ | ✓ | ✓ | ✓ |

[A] Test Method D 2265 may be substituted.

## X2. CLASSIFICATION MAINTENANCE

X2.1 The automotive service grease classification is designed to keep abreast of changing requirements by redefining existing, or adding new categories. To expeditiously accomplish such action, close coordination among the ASTM, NLGI, and SAE[8] is required. Although it is neither possible nor desirable to develop rigid operating rules, the following is a summary of the guidelines to be followed for changing this standard.

X2.1.1 Any individual, company, or society can request changes in, or additions to, the grease categories.

X2.1.2 SAE, with cooperation from ASTM and NLGI, considers whether the request is consistent with the overall classification objectives.

X2.1.3 SAE, with the concurrence of ASTM and NLGI, either accepts or rejects the request.

X2.1.4 If the proposal is accepted by SAE, it is referred to ASTM for selection and standardization of test techniques and development of performance criteria, and it is referred to NLGI for development of user language.

X2.1.5 ASTM, NLGI, and SAE are kept informed of progress by liaison membership in the task groups developing the proposal. Each society completes its part of the development, documents it, and solicits comments from the other societies. When the societies are in agreement, each publishes the results of its program.[9]

[8] The SAE Fuels and Lubricants Technical Committee 3 on Driveline and Chassis Lubrication has responsibility for the basic objective of this standard and its promotion within the automotive industry.

[9] In addition to each society maintaining and publishing their respective portion of this classification and specification, the NLGI Letter Designations and Classification Description and the essentials of this classification and specification are reprinted in "SAE J310 Automotive Lubricating Greases," (*SAE Handbook*, Society of Automotive Engineers, in order to receive widespread dissemination among the automotive industry.

## X3. NLGI SYMBOL

X3.1 The NLGI[10] has developed a symbol that can be used on containers of greases that conform to the require-ments of one or more categories listed in Table 1 and Table 2.

[10] Additional information can be obtained from the National Lubricating Grease Institute, 4635 Wyandotte St., Kansas City, MO 64112.